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THE "EMPTY BRONCHUS" TREATMENT BY POSTURE IN THE BRONCHIECTASIS OF CHILDREN.

By WILLIAM EWART, M.D.

I do not propose on this occasion to go over the entire ground which was recently covered by my paper on "The Principles of Treatment of Bronchiectasis," read before the East Sussex Medico-Chirurgical Society at Hastings, but rather to confine myself to the special points in the mechanical part of the treatment in children. This intractable disease, if it is to be cured at all, is more likely to be cured in childhood than at any other age. And the responsibility is great of not missing that better chance by delay.

A sad instance in point is the lamented death a few days ago of the little patient, W. C—, aged five years, who had suffered from the affection since an attack of pneumonia nearly three years ago. Her systematic treatment in July, 1907, on the inclined bed, and by the prone posture on the all-fours exerciser, was of very short duration owing to the temporary closure of the ward. When at last her mother brought her again a month ago, she had developed lardaceous disease and albuminuria. Although after a few days of postural treatment the expectoration was greatly reduced, so that even partial inversion did not lead to much being coughed up, the fœtor showed no improvement; and the probability that ulcerative and necrotic changes had occurred in the dilatations was borne out by the patient's rapid failure and final exhaustion;

ELIART

but an autopsy could not, unfortunately, be obtained. I believe that had she been under continuous treatment during the last twelve months she would have been, not only alive to-day, but probably vastly improved under the treatment which I have to describe to you as the "empty bronchus method." For there is reason to believe that a well-drained bronchus is also one that practically ceases to secrete.

The principles of treatment.—This brings me to say a word of introduction on the general question. There are two fundamental principles which must be carried out if any line of treatment which may be adopted is to be successful. One of them is to *empty the bronchus, and to keep it empty.* The other principle is to *fill the lung with air, and to keep it actively expanding.* These two objects were conveyed in the title of the paper published in the 'Lancet' for July the 13th, 1901, which tells of the difference between the practice of this century and that of previous ones—"The Treatment of Bronchiectasis by Posture and by Respiratory Exercises."

The various modes of treatment.—On this as a basis various therapeutic measures may be founded with good hope of success. It is not my object to deal with them to-day, but it is right to enumerate them. (1) The latest, which is advocated on rational lines, and practised with success in phthisis as well as in bronchiectasis by Dr. Colin Campbell, of Southport, is the direct medicinal treatment of the bronchus by *intra-tracheal injections.* He finds that it is capable of application even in young children. (2) Of great importance is also Arnold Chaplin's well-known method of *creasote inhalation.* It is also applicable in young children, and it is recognised to be the most effectual means of overcoming by medicinal agencies the fœtor of the expectoration and of the breath. (3) In the third place, we have a variety of internal remedies which I need not enumerate; and, lastly, (4) a large assortment of inhalations made available by methods to which I may presently refer.

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The mechanical methods which I have to urge as essential adjuncts to these various plans combine two objects, *the bronchial and the pulmonary,* which are distinct, but possess one great feature in common—they are both intended for *continuous application,* in the strict sense.

The Intermittent Postural Treatment.

The bronchial treatment is mainly postural. It is strange that the obviousness of this indication should have so long escaped notice. My own earliest employment of the *ultra-prone position or inversion* dates back many years in connection with the emptying of basic cavities in phthisis. It was not a novel device, at any rate in this country, and had been advocated and practised before ; and it is the type of what I shall term the *intermittent postural method,* which should rightly be connected with the name of H. Quincke,* of Kiel. In 1898 he published his short but weighty "Contribution to the Treatment of Bronchitis," in which he suggested the inclined prone position for adoption for comparatively short periods once or twice daily, for the sake of bronchial drainage in cases where this was wanted. In October, 1900, Jacobson† published a further account of the method, with cases in which the inclined posture had been used for periods of one hour once or twice in the course of twenty-four hours with favourable results. These papers were not known to me until I consulted the literature in connection with the publication of my own paper mentioned above. In the latter I advocated the *continuous postural method* by keeping the patient in bed, and by raising the foot of the bed considerably so as to keep up a strong downward slant from the bronchi to the larynx, whatever the positions might be into which the patient might turn during sleep.

The intermittent "ultra-prone" posture or "inversion"

* 'Berlin Klin. Woch.,' 1898, p. 525.

† *Ibid.,* 1900, p. 904.

is the most rapid and effectual for the evacuation of accumulations in the cavities of phthisis or of bronchiectasis. The patient leans over the side of the bed or of a table, placing the hands on the ground, so that the long axis of the thorax approaches to the vertical. A few coughs will rapidly clear away the greater part of the collection. The method is fortunately available in children in a degree not to be attained in the adult, for even up to adolescence they are not alarmed at the thought of "standing on their head." Infants will bear to be held vertically head downwards, and in small children something approaching to actual inversion may be safely resorted to. These extreme positions, in which patients are encouraged to cough and to expectorate, are exceedingly useful for dislodging remote accumulations, and it may be possible to improve the opportunity by the judicious application of bi-manual pressure at the base of the thorax judiciously performed and limited to the period of expiration. As a fact, *absolute* inversion is not necessary. The child may be either held in the ultra-prone position by the nurse, or laid across a low chair or a stool, with the hands on the floor, in imitation of the procedure in the adult.

The intermittent prone postural method of Quincke is likely to come into extensive use in various affections, and I have devised with that view, and had constructed, a set of appliances or machines enabling me to apply the prone method with graduated inclinations and lateral positions, according to the requirements of the case and of the affection under treatment.

The Continuous Postural Treatment.

The continuous treatment has three practical instalments: *The nocturnal postural treatment; the diurnal postural treatment;* and the *respiratory treatment by means of the elastic belt and of the "exerciser."*

(1) *The costo-abdominal elastic belt* should be worn during the night as well as the day, for its virtue is active for good during each breath that is drawn. If this were neglected, the loss of advantage to a child during the ten hours' night sleep might be easily reckoned up in figures to an important total. The belt itself, made of waterproof material, easily washed and dried, has its buckles in front, and at one or both sides an insertion of a lacing of indiarubber cord or tubing. It is mainly *abdominal*, extending some way below the umbilicus, and upwards not quite as far as the costal arch. But I have found it useful to attach to it in the back a *lower thoracic elastic band*, one or two inches wide, also buckling in front, which, being quite separate except over the spine, where it is continuous with the belt, can be carried obliquely over the costal arch, and its buckle fastened to the night-gown by a safety-pin at any level desired. Its pressure can thus be regulated nicely so as to be just sufficient to stimulate the costo-abdominal breathing. I have explained elsewhere the probable mechanism of the advantage accruing to the upper costal breathing from wearing the abdominal belt. The recurring stimulation of the diaphragm with each expiration by the artificial elastic recoil of the abdominal contents calls reflexly into action some of the apparatus for extraordinary respiration, and in particular the upper costal muscles, whilst it directly amplifies in a marked degree the inspiratory excursions of the diaphragm. It goes without saying that judgment is requisite in dealing with so active a therapeutic agent.

(2) *The nocturnal treatment.*—This should be made as effectual as possible. Everything depends upon the declivity of the inclined plane being effective, not, as might happen, illusory. In the first place, as the distance from the diaphragm to the larynx is so short in a little child, *the angle* of the inclined plane must be relatively greater. In the "bronchiectasis cot," which I have to describe, the foot end of the "fracture-bottom" must

therefore be secured to its graduated support at a higher level.

The "bronchiectasis cot" is easily prepared in the case of the ordinary bed-shaped cot with high end rails as well as side rails. A fracture-bottom is placed under the mattress, and its foot end must be raised to the desired height by means of the *graduated support,* the other end extending as far as the head rail.

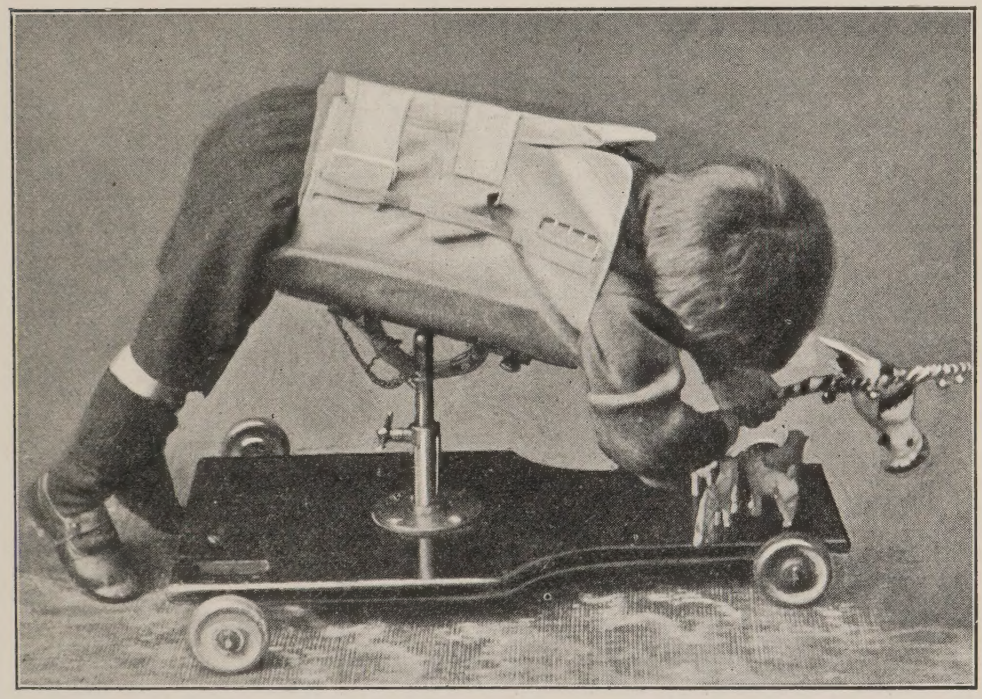
The graduated support is simply a firm board of sufficient width, from which project two thick movable wooden pins to bear the weight of the foot end of the fracture-bottom. The board is perforated with two parallel vertical rows of holes to receive the pins. A strap passed through two of the holes not in use and round the upright rails will ensure its stability. This, or some similar contrivance, will be found convenient for hospitals, as it occupies little space for storage and offers the choice of several positions to suit various cases. For private patients it is easy to obtain the same result by slinging the end of the fracture-bottom on a rope fastened to the foot posts, and passing underneath through eyes or holes to prevent any slipping.

The mattress having thus been duly slanted, it is necessary, in the second place, that the slant of the thorax itself be made a genuine one by posture. It is clear that, let the degree of inclination be what it may, if the child were to lie transversely to the cot the long axis of the chest would be horizontal, in spite of the inclination; and as this almost invariably happens it will be often found necessary to let the child lie between two sandbags, which will also afford assistance against the tendency to slide down the slant "into a heap." In the groove thus formed the child can lie in any decubitus; the more this is varied so much the better.

Another practical point is *the bolster.* The bolster must be *small and firm,* for the support of *the head only;* and to this effect it should be secured to the head rails so as not to be displaced. The ordinary square pillow and

squash bolster are quite unsuitable, as they extend under the shoulders and thus modify the inclination in the direction of the horizontal. With these practical precautions the nocturnal instalment of treatment becomes one of the most important.

(3) *The diurnal treatment* is, as previously stated, the agent *par excellence* of pulmonary regeneration, whilst it also affords the most effectual means, next to inversion,



The all-fours exerciser in use.

for drainage. The prone posture which is to be kept up is anatomically the most direct for that purpose (the greater bulk of the lung being posterior), and brings to bear the respiratory activities of exercise for emptying the sacculations by lateral compression. The all-fours exerciser, upon which the prone treatment is conducted, is a small edition of one of the arrangements which are provided for in my "convalescent machine" for the adult. The supporting body trough, upon which the child is secured by a broad belt, is provided with three sets of

movements regulating its height and its inclinations from end-to-end and from side-to-side. The lateral inclination is usually not called into play here. It is specially used for the lateralisation of the chest in empyema, pleurisy, and other conditions requiring special unilateral measures of rest or of re-expansion.

The end-to-end declivity required is that which will bring the shoulders appreciably lower than the hips, and at that angle the child is made to recline in the prone position.

Prone exercising.—The height of the body trough is to be so adjusted as to allow free use of the four limbs—the feet for propelling the machine (the front wheels of which might be made also workable by the hands), the arms and hands for any appropriate work or amusement. In this way, quite independently of any of the dumb-bell and *respiratory exercises* for practice at stated intervals, a good deal of activity is thrown upon the limbs and the neck, and this brings fully into requisition the posterior and basic pulmonary districts. A table can be improvised in front of convenient height for drawing or writing, and to hold the book for reading, or cushions to rest the head. *Prone exercising* need not, therefore, imply idleness or complete interruption of the lessons.

"*The all-fours exerciser*" for children,* and the "*convalescent machine*" for adults,† illustrations of which are included in my paper "On Convalescence and its Stages," ‡ are purposely adapted for most varied medical and surgical affections. They are therefore specially suitable for hospitals and institutions, where they can be in constant use, thanks to their adjustability. But for a makeshift, and as only one position is required, any individual case of bronchiectasis in a child is easily extemporised by padding a high stool, cutting down its

* Constructed for me by Mr. G. P. Turner, of 16, Eccleston Street, S.W.

† Constructed for me by Mr. John Ward, of 246, Tottenham Court Road, W.

‡ 'Medical Press and Circular,' February the 19th, 1908.

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legs to the extent desired, and finally mounting it upon wheels. Or we may adapt for our purpose, with slight modifications, Dr. Tucker Wise's "inclined plane for phthisis," a description of which was published in the 'Lancet,' vol. i, p. 1546, 1908.

The rationale of the "empty bronchus method" has probably been made clear by the foregoing practical description. It aims at stopping the bronchial irritation and hyper-secretion by bronchial drainage and by pulmonary ventilation, and at reclaiming for active pulmonary expansion the thoracic space usurped by the dilatations and by the fibrous tissue. This vicarious pulmonary development is eminently attainable in childhood, and therefore within our own gift; let it not be withheld. As even one day of this treatment is a gain, every succeeding day will be a further step towards a cure.

Is any further treatment necessary? Advanced and neglected cases may need a good deal more of it than could be discussed here. Early cases will certainly need very little. But for both sets of cases *inhalation* is of value. The simplest form is the *respiratory bib*, a two-fold piece of flannel soaked in terebene or other inhalant, and enclosed in an open bag of jaconnette to be secured between the night-shirt and under-vest, just below the collar, so that the impregnated air is constantly being inhaled.

The dry bottle inhaler, filled with horsehair and with small pieces of blotting-paper steeped in the inhalant, is a variation on the same theme, acceptable to children for variety's sake, and because of the tube and its mouthpiece. Whether they blow or whether they suck through it, none of the strong fluid can come into their mouth.

These devices will generally render unnecessary the more searching treatment by the creasote chamber, even in cases of fœtor. But, in conclusion, they too may be superfluous if the rational treatment be conducted, instead of in a crowded town, in the pure air of the mountain or in the strong air of the sea. *Atmosphere and climate* are

the most potent and sometimes the most indispensable of our adjuncts, and in children they are likely to produce results not to be equalled in the treatment of adults.

(*Read May the 8th,* 1908.)

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